

New Records of Pteridophytes for Botswana

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ABSTRACT.—In a survey of the pteridophytes of Botswana, the family Isoetaceae was encountered and is a new record for Botswana. The family is represented by a single species, *Isoetes schweinfurthii*. Also recorded for first time in Botswana were three other species: *Ophioglossum lancifolium*, *Actinopteris dimorpha*, and *Marsilea minuta*.

Although the pteridophytes of southern Africa have been thoroughly and very capably surveyed (Schelpe, 1970; Jacobsen, 1983; Schelpe and Anthony 1986; Burrows, 1990), new explorations are adding to knowledge regarding their specific ranges. Botswana is a semi-arid country situated in the south-central part of the African continent and has three major ecological regions (Parson, 1993). In the northern region there are the Okavango Delta and the ancient lake beds of the Makgadikgali Pans. The southern area comprises the Kalahari Desert, characterized by fossil sand dunes and scrub and bush savanna. Between the Okavango-Makgadikgali and the Kalahari Desert, is an intermediate ecological zone known as the Hardveld region, dominated by sandy soils.

The records for ferns and fern allies in Botswana have yet to be finalized. Herein we report the occurrence of four pteridophyte species not yet recorded for the region (Fig. 1). One of them is a representative of a family also new to the records for Botswana.

RESULTS

The family Isoetaceae contains nine species in South Africa distributed in all countries of the region with the exception of Botswana, according to Burrows (1990). In our survey of the pteridophytes of Botswana, we found *Isoetes schweinfurthii* at a single locality. Other new records include *Ophioglossum lancifolium*, *Actinopteris dimorpha*, and *Marsilea minuta*. Details are presented below and localities are mapped in Fig. 1.

***Isoetes schweinfurthii* A. Braun in Baker.**

Rhizomorphs are trilobed, up to 15 mm in diameter, and have scales that are horny, dark-brown, and deltate to elongate. Each plant may have up to 40 erect sporophylls in number, 11–38 cm in length, with persistent orbicular

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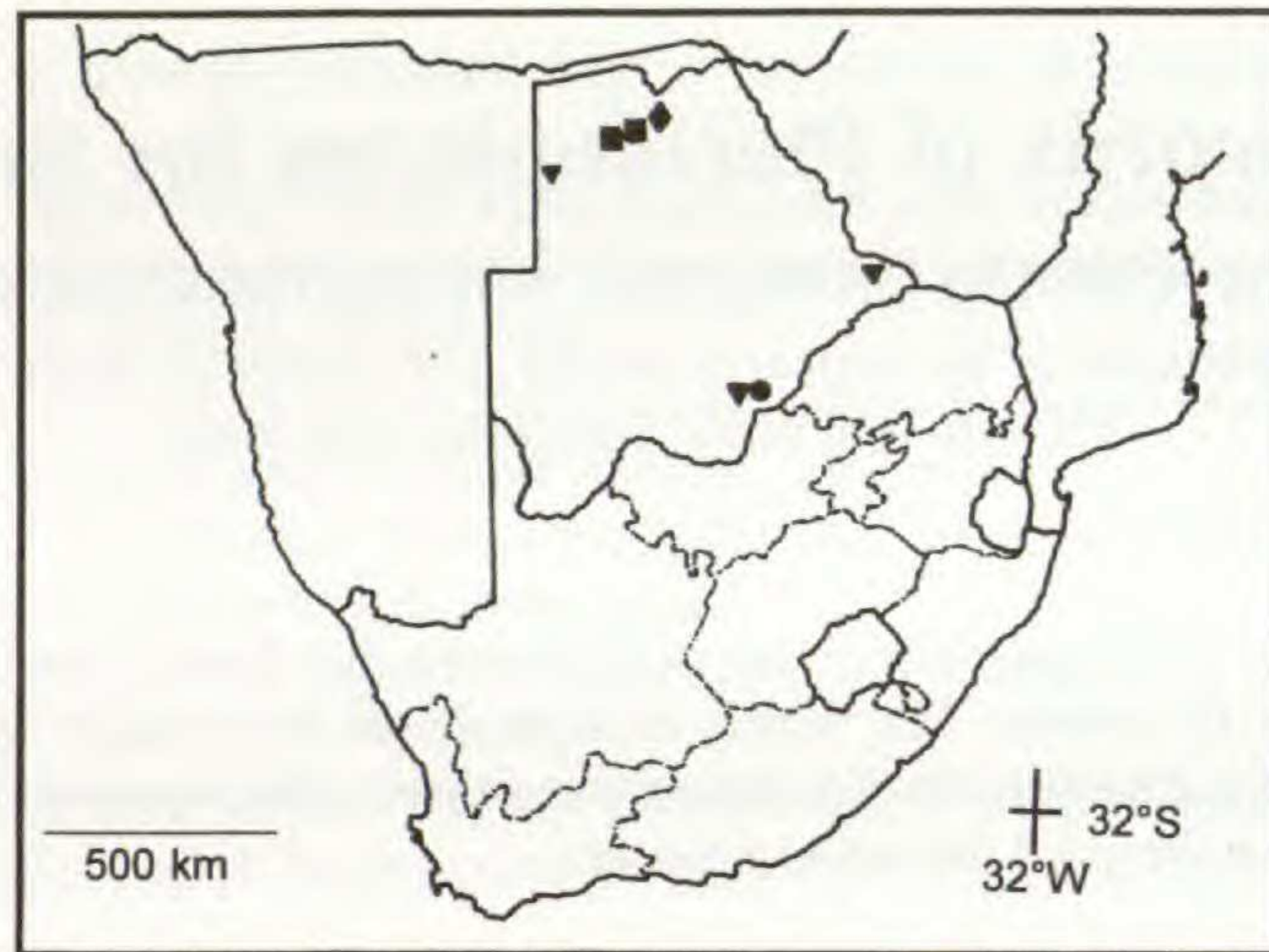


FIG. 1. Geographical distribution of new pteridophyte records from Botswana (● = *Isoetes schweinfurthii*, ◆ = *Ophioglossum lancifolium*, ▼ = *Actinopteris dimorpha*, ■ = *Marsilea minuta*).

bases 5–10 mm broad with tapered apices and deltate ligules. The sporangia are obovate to orbicular, 7–12 mm × 6–8 mm, without a velum. Megaspores have prominent tubercles on their distal faces and are flat or tuberculate on proximal faces. Microspores are alate.

Isoetes schweinfurthii is the only species of this family occurring in Botswana, having been localized in the southeastern section of the country, north of Kgale Siding near the Gaborone Dam. Its general distribution includes the areas of eastern Transvaal in South Africa, Namibia, Zimbabwe, Angola, Mozambique, Tanzania, Sudan, Central Africa Republic, Ivory Coast, Senegal, Morocco and Madagascar. Its specific habitats are pools in rocky outcrops. Herbarium voucher: *Hansen 3401* (PRE).

***Ophioglossum lancifolium* C. Presl.**

Rhizomes are elongate, up to 5 cm in length. Roots are thick and horizontal. Vegetative blades are linear to oblanceolate, or narrowly elliptic, 15–80 mm × 2–12 mm. Bases are cuneate, gradually tapering into an elongate pseudo-petiole, and the apices are apiculate. Fertile blades are 30–150 mm in length and are inserted at the base of a sterile blade. Sporangia are in 8–23 pairs.

Ophioglossum lancifolium is distinguished from two other species of the genus occurring in Botswana by morphology of the vegetative blade and of the rhizome. Vegetative blades are narrowly elliptic to linear-lanceolate (less than 12 mm broad) in *O. lancifolium*, and elliptic to ovate-cordate (up to 40 mm broad) in *O. polyphyllum* A. Braun. *Ophioglossum lancifolium*, with oval to linear rhizomes, can be distinguished from *O. costatum* R. Br., which has orbicular rhizomes.

Ophioglossum lancifolium is found in seasonally wet places in the region of Savuti, north of Leopard Hills in North Botswana. It is generally distributed in the southwestern portion of the Cape Region of South Africa and scattered

in eastern South Africa to Zimbabwe, Namibia, Angola, Zambia, Malawi, Tanzania, Kenya, Uganda, Zaire, Mali, Ethiopia, Madagascar, Réunion and the Comoro Island. Herbarium voucher: *Jacobsen 3523* (PRE).

***Actinopteris dimorpha* Pic. Serm.**

Rhizomes are 5 mm in diameter, with pale brown scales up to 5 mm long. Fronds are densely tufted, erect, coriaceous, and dimorphous. The stipes are glaucous, mostly glabrous, bearing a few linear scales up to 19 mm long. Blades are flabellate with truncate bases, and dichotomously divided into as many as 16 glaucous, linear segments. Fertile fronds are longer than vegetative ones. Segments are entire, but with 5–7 teeth at the apex. Margins usually are reflexed, with the undersurface having linear brown scales.

Actinopteris dimorpha can be distinguished from the one other related species of the genus occurring in Botswana, *A. radiata* (Sw.) C. Chr., primarily by its scale morphology and number of blade segments. *Actinopteris dimorpha* bears a few linear scales, whereas those of *A. radiata* are lanceolate. *Actinopteris dimorpha* has up to 16 glaucous, linear segments, whereas *A. radiata* has 20–48 segments.

Actinopteris dimorpha has been collected in the Aedume Park in Gaborone (*Hansen 3350*, PRE), in the Lepoloke Hills north of Bobonong (*Campbell 179*, PRE), in the Aha Hills of the Ngamiland District (*Long and Rae 374*, PRE), and in the Kgale Mountain in the vicinity of Gaborone (*Mott 1015*, PRE). It is distributed in the Transvaal Region of South Africa, Zimbabwe, Mozambique, Malawi, Zambia, Tanzania, Somalia, Madagascar, the Comoro Islands, and Réunion. The habitat is generally rock crevices and boulders.

***Marsilea minuta* L.**

Fronds of this species have leaflets thinly pilose, usually glabrous and not translucent. Leaflets of the floating forms are ovate with distal margins rounded, entire or shallowly irregular. Stipes of the dry form are up to 13 cm in length, the leaflets obovate, and distal margins entire or sinuate. There are (1)2–4 sporocarps per cluster, these densely pilose and becoming glabrous with age. Sporocarps are variable in size, elliptic in dorsiventral cross-section, dark brown to almost black, and both teeth are very prominent.

Marsilea minuta is distinguished from other closely related species of the genus in Botswana primarily by the morphology of its pedicels and sporocarps. Pedicels in *M. minuta* are branched, separating it from eight other non-branched species occurring in Botswana. *Marsilea minuta* also has 2–4 sporocarps per cluster with prominent teeth, separating it from *M. apposita* Launert (inferior tooth absent) and *M. ephippiocarpa* Alston (3–10 sporocarps per cluster).

In Botswana, *M. minuta* has been collected on Xhere Island (*Smith 652*, PRE) and the Thaoge River (*Smith 1525*, PRE) in the Okavango Delta. It is generally distributed in Natal South Africa, Mozambique, Zambia, Malawi, Angola,

widespread through Africa to Guinea Bissau and Algeria, Madagascar, the Comoro Islands, and India. The habitat is in areas that are seasonally flooded.

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